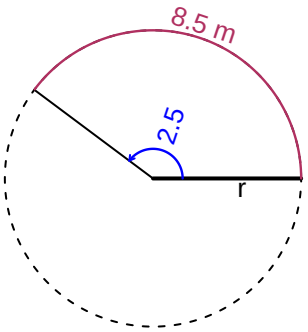
Name: Date:

Trig Final (SLTN v649)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 8.5 meters. The angle measure is 2.5 radians. How long is the radius in meters?

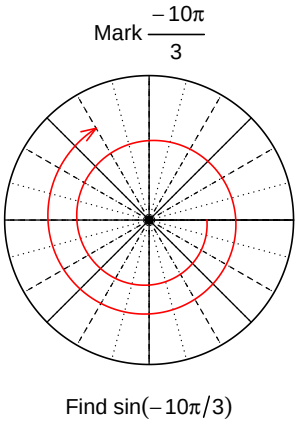


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

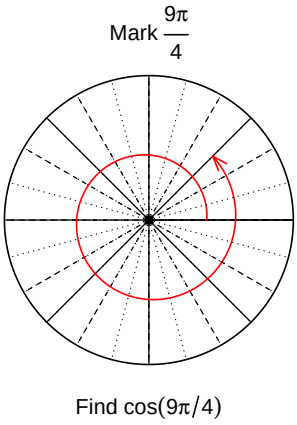
$r = 3.4$ meters.

Question 2

Consider angles $\frac{-10\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-10\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-10\pi/3)$



Find $\cos(9\pi/4)$

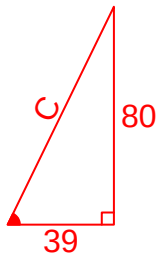
$\sin(-10\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{80}{39}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

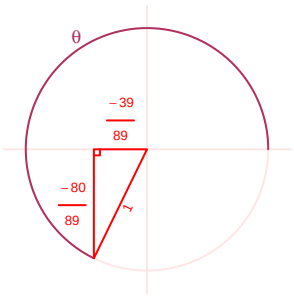
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + 80^2 = C^2$$
$$C = \sqrt{39^2 + 80^2}$$
$$C = 89$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-39}{89}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.64 Hz, an amplitude of 5.25 meters, and a midline at $y = -7.64$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.25\cos(2\pi 3.64t) - 7.64$$

or

$$y = 5.25\cos(7.28\pi t) - 7.64$$

or

$$y = 5.25\cos(22.87t) - 7.64$$